

Wings

The 20th annual Wings Over Houston air show welcomed Johnson Space Center Oct. 16 and 17. In addition to NASA aircraft, JSC also displayed the International Space Station Trailers, a replica of a Mars Exploration Rover and information about the Vision for Space Exploration.



NASA/Blair JSC2004E46033

Clockwise from left: The World War II demonstrations reenacted famous battles from the war with prop-driven aircraft from the round-engine era.

Two-year-old Cain Landry from Pearland, Texas, poses for a photo in the spacesuit.

Colin Perkins and Adaire Mullins of Ft. Pierce, Fla. take a close-up look at the displays inside the International Space Station Trailer.

The Fielding family and the Humphries family admire the Super Guppy.



NASA/Blair JSC2004E46022



NASA/Blair JSC2004E46027



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Space Center Roundup

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SPACE CENTER ROUNDUP

Lyndon B. Johnson Space Center



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Ain't no mountain high enough

Dean Eppler scales a hill at Johnson Space Center's EVA Remote Field Demonstration Test Site in preparation for a trip to a remote field testing site near Flagstaff, Ariz. The sand, grit, dust, rough terrain and extreme temperature swings of the desert simulate some of the conditions that may be encountered on the Moon or Mars. In September engineers and scientists led the Desert Research and Technology Studies (RATS) team from JSC and Glenn Research Center on a mission to evaluate prototype spacesuits, rovers and science gear.

For more on Desert RATS, see pages 6-7.

November
2004
Houston, Texas

Beak sends...

A MESSAGE FROM CENTER DIRECTOR
LT. GEN. JEFFERSON D. HOWELL JR.



Thanksgiving

During this month of November, I hope that everyone has the opportunity to spend time with family and friends to celebrate all the wonderful blessings that we enjoy as citizens of this great nation.

I hope that you will also remember our Astronauts and Cosmonauts in space as well as the the brave men and women serving in our armed forces around the globe. Let us say a special prayer for those in harm's way as well as their families who suffer the trial of waiting and hoping for their safe return.

Please know how thankful I am to be on the JSC team and to be a part of this noble endeavor that we are about. Happy Thanksgiving!

It's great to be alive and in Houston!

Beak sends...

Guest column



Pioneers

In the span of five days, we lost two genuine pioneers of manned spaceflight. We should be in awe of their accomplishments chronicled on these pages. We should also pay attention to how they went about this business in their days, as each of their styles in approaching the unknowns of manned spaceflight couldn't have been more diverse. Gordon Cooper showed exuberant confidence in his readiness to take on this new world. Max Faget exuded thoughtful engineering excellence and innovation in solving problems in Cooper's new world. Both styles were needed then, and I suggest to you that both styles are still needed today. Continuing to fly the International Space Station safely, returning the Space Shuttle to flight and turning the Exploration vision into reality all require engineering excellence and innovation, complemented by exuberant confidence. And, as in Cooper's and Faget's days, the diversity of styles we share in this business and the mutual respect we must have for each other's talents will continue to be the foundation allowing us to continue their legacy.

Milt Heflin
Chief of the Flight Director Office

The KC-135 fades into the sunset

by Trisha Sims

On Oct. 31, 2004, Ellington Field retired the well-known KC-135 aircraft, otherwise known as the "Vomit Comet," to old age. Future plans are to replace the KC-135 aircraft with a C-9, enabling NASA to continue its reduced-gravity program.

The KC-135 was first used by the U.S. Air Force as a refueling tanker. It was brought to NASA in 1973 to replace the C-135, which had been used to replicate a weightless environment.

Astronauts in training have been required to go up in the KC-135 at least one time every year since it was brought to Ellington Field 31 years ago. This specialized aircraft gives astronauts an idea of what microgravity feels like and also provides a test vehicle for new technology.

To simulate reduced gravity, the KC-135 aircraft climbs 8,000-plus feet over the Gulf of Mexico and then begins to freefall – a procedure known as a parabola. The pilot is allotted 24,000–37,000 feet over the ocean to perform 40–60 parabolas during a two-hour mission.

In 1996, NASA gave college students the opportunity to conduct microgravity experiments while onboard the KC-135, making it possible for more than 1,600 students to perform several different kinds of scientific investigations. John Yaniec, the lead test director for the Reduced Gravity Program, said he has enjoyed seeing the excitement on the students' faces while they conducted their experiments.

Comparing all of the different projects that he has seen as a flight director, Yaniec believes that "the Reduced Gravity Program helps pave the way for students and engineers to conduct cutting-edge research experiments that will someday become major contributions to the world of science and technology."

According to Yaniec, the experiments that made the biggest impression on him involved combustion and cool flames. "The KC-135 is the only platform that can provide certain gravities such as lunar, reduced gravity, Martian gravity and a sustained hypergravity."

This is where the plane gets the nickname the "Vomit Comet." Usually one out of every three passengers gets sick while



Astronaut class number 17 on their Zero-G familiarization flight in the KC-135.

onboard the plane. Yaniec, who has performed a total of 30,775 parabolas as of Oct. 1, is one passenger who has never gotten sick. "Our crew is aware of the importance of each passenger's safety while on the plane. We are willing to help take care of sick passengers," Yaniec said.

After several years of flying onboard as a test director, he has affectionately nicknamed the plane "Bertha." Well-known passengers that Yaniec remembers taking flight in the KC-135 are Journalist Hugh Downs and Dr. Simon Ostrach, who became the oldest person to fly on the aircraft at the age of 80.

When asked about his personal feelings on retiring the aircraft, Yaniec said that "the aircraft's frame is in good shape for having performed over 34,342 parabolas as of Oct. 1. However, it is becoming logistically hard to support the engine because it is currently the only Model KC-135A still flying."

The C-9 aircraft, which replaces the KC-135, will make its debut by the end of January or the beginning of February. The new plane has a smaller research area than the KC-135, but it will serve the same purpose by simulating microgravity for future scientists and current astronauts.

Kindling an interest in saving lives

by Catherine E. Borsché

Houston Fire Department captains recently arrived at Johnson Space Center with a helmet in hand that had been burnt through in a fire. The firefighter who had worn the helmet was in the hospital suffering from severe burns.

These captains came to NASA with one specific purpose. They wanted to tap into NASA technology to prevent situations such as the one described from occurring again. In particular, the firefighters were most interested in utilizing the technology used in Space Shuttle thermal protection system tiles, which can withstand heat up to 2,000 degrees Fahrenheit, to improve firefighter suits.

The JSC Habitability and Environmental Office's Firefighter Suit and Gear Project Team answered the Houston Fire Department's appeal to help design a better firefighter suit. This suit, dubbed the Firefighters Integrated Modular Suit, was designed to solve three major issues that firefighters face when going into a burning building: insulation from the environmental heat of the fire, protection from metabolic heat problems (such as heat stroke), and an improved, longer-lasting air supply.

Firefighters work in one of the most extremely hazardous environments known to humans. A typical house fire can reach 2,000 degrees Fahrenheit after just five minutes of flame, becoming lethal in a matter of seconds. In the current firefighter suit, a firefighter crawling on the floor of a burning building can withstand temperatures of 200–300 degrees Fahrenheit for about 30 minutes. This firefighter also has an air supply that can last up to 30 minutes. However, one of the most dangerous influences on a firefighter's ability to work is the firefighter's own core body heat. Half the firefighters who die each year are killed from metabolic heat problems and not the fire itself. If a firefighter is working hard and burning calories at a rate of 500 calories per hour, that firefighter's internal temperature can rise to dangerous levels. The firefighter's own body becomes the enemy by killing off cells – and eventually, causing a heat stroke.

"The situation that the burnt firefighter was in is what's called 'flashover,'" Theodore "Tico" Foley, JSC human factors analyst, said. "Basically, what happens is that you have a fire going on inside one wall, and it gets so hot that the radiant heat from that wall ignites the opposite wall and all the smoke and combustibles in between. Immediately, the temperature rises from approximately 500 degrees to 1,500–2,000 degrees – just in a flash."



Human Factors Analyst Theodore "Tico" Foley is shown wearing the Firefighters Integrated Modular Suit with its breathing and cooling apparatus. The suit was designed by the Firefighter Suit and Gear Project Team to demonstrate how advanced technology already used for spacesuits can provide better protection for firefighters.

The Firefighter Suit and Gear Project Team went to work to search for better materials and technology to give firefighters the optimum equipment to survive such dangerous scenarios.

"With the current firefighter suit prototypes that we have right now, we use a combination breathing and cooling device. So, instead of taking compressed air on the backpack, the inventor who had worked on the Apollo Program realized that you could use cryogenic, supercritical air," Foley said. "That's what we use on the Shuttle right now for air resupply."

The advantage of utilizing this technology is that firefighters can take an oxygen and nitrogen air ratio and put it into one container. By keeping the air so cold and at a lower pressure, twice the amount of air can fit into a smaller bottle at a lower weight.

"The whole concept comes from NASA and was just miniaturized and put on someone's back," Foley said.

To address the firefighters' metabolic heat concerns, the Firefighter Suit and Gear Project Team integrated a cooling garment into the prototype suit that is virtually identical to the garment used in spacewalk spacesuits.

"It's basically just long johns with tubes of water or antifreeze of some sort going through it," Foley said. "You have two loops: the air loop, providing the cooling, and the water loop, which takes the heat from the body and exchanges it in the heat exchanger. You're not mixing the air with water, but you're passing it through, (similar to what) would happen with a radiator in a car."

By using supercritical, cryogenic air and a cooling garment, two of the issues are solved in creating a better firefighter suit. The firefighter has double the amount of air and a system to provide metabolic cooling.

The Firefighters Integrated Modular Suit also includes tailoring concepts taken from the spacewalk spacesuit.

"We've put in gussets and balloon joints so that we have more mobility. For example, if I raise my hands to fight a fire, the hem does not expose my wrists," Foley said. "We would also like to take the joints that we have for shoulders and elbows and miniaturize (them) for the firefighter's glove to give it greater movement and dexterity."

For this concept to be integrated and put into use, the concept firefighter suit would need to pass many levels of certification. Even though it has currently only passed a few levels of certification, there is an immediate application potential for using the suits here at NASA on the ground. The suits can be used for training and for the future development of advanced spacesuits.

"People are interested in seeing how this technology will emerge," Foley said. "With alterations, an inventor has the means available to him to develop suits that can be applied to lunar planetary surfaces using the same types of concepts. There are many direct applications for this technology to help us here at NASA, as well as the lifesaving and productivity capability for firefighters and first responders."

"I think it's an excellent program. This is certainly a benefit to NASA, too, in a sense that the public can see how our technology has benefited this country," John Jackson, human factors engineer, said. "It has a lot of implications in the firefighting world. The motivation is to help save lives."

NASA's Desert 'RATS' test new gear



by Kelly Humphries

ARIZONA'S HIGH DESERT isn't quite as tough on equipment as the Moon or Mars, but few places on Earth can give prototype spacesuits, rovers and science gear a better workout.

A NASA-led team headed for sites near Flagstaff, Ariz. in September to test innovative equipment. Engineers and scientists lead the Desert Research and Technology Studies (RATS) team from Johnson Space Center and Glenn Research Center. The team includes members from NASA centers, universities and private industry. Their efforts may help America pursue the Vision for Space Exploration to return to the Moon and travel beyond.

The sand, grit, dust, rough terrain and extreme temperature swings of the desert are attractive, simulating some of the conditions that may be encountered on the Moon or Mars. Crews wearing prototype advanced spacesuits are using and evaluating the new equipment for two weeks during September.

"For field testing, the desert may be the closest place on Earth to Mars, and it provides valuable hands-on experience," said Joe Kosmo, JSC senior project engineer for the experiments. "This work will focus on the human and robotic interaction we'll need for future lunar and planetary exploration, and it will let us evaluate new developments in engineering, science and operations," he said.

The team conducted a series of live satellite link videoconferences between researchers in the field and students at eight NASA Explorer Schools.

The 2004 Desert-RATS team includes participants from NASA's Ames Research Center, the NASA Research and Education Network team, Oceaneering Inc., Hamilton Sundstrand Inc., ILC/Dover Inc., the University of Cincinnati, the University of Maryland and Worcester Polytechnic Institute.



The Desert Research and Technology Studies team members put their technology through its paces in preparation for the testing in Arizona. From left to right: Chuck Beckman, Jessie Zapata, Dean Eppler (in suit), Nathan Smith, Edward Ehlers, Craig Bernard, Amy Ross, Barbara Janoiko, Bill Welch. Sitting: Joe Kosmo, Kevin Groneman.

Engineers in the Exploration Planning and Operations Center at JSC are providing mission control-type monitoring of the field tests.

The test equipment includes:

- New spacesuit helmet-mounted speakers and microphones for communications
- A "field assistant" electric tractor that can follow test subjects in spacesuits. It is guided by spacesuit-mounted controls
- A wireless network for use on other planets that can relay data and messages among spacewalkers, robots and rovers as they explore the surface
- A two-wheeled chariot that could be pulled by the electric tractor to carry astronauts
- "Matilda," an autonomous robotic support vehicle that can retrieve geologic samples
- Analytical equipment mounted on two mobile geology labs

Spacecraft Designer Max Faget dies

by Amiko Nevills

The man who designed the original spacecraft for Project Mercury and is credited with contributing to the designs of every U.S. human spacecraft from Mercury to the Space Shuttle has died.

Dr. Maxime A. Faget, who in 1958 became part of the Space Task Group that would later evolve into the NASA Johnson Space Center, died Oct. 9 at his home in Houston. He was 83 years old.

“Without Max Faget’s innovative designs and thoughtful approach to problem solving, America’s space program would have had trouble getting off the ground,” said NASA Administrator Sean O’Keefe. “He also was an aeronautics pioneer. In fact, it was his work on supersonic flight research that eventually led to his interest in spaceflight. The thoughts and prayers of the entire Agency are with his family.”

Faget’s career with NASA dates back to 1946, when he joined the staff of Langley Research Center, Hampton, Va., as a research scientist. He worked in the Pilotless Aircraft Research Division and later was named head of the Performance Aerodynamics Branch. He conceived and proposed the development of the one-person spacecraft used in Project Mercury.

Faget was selected as one of the original 35 engineers who served as the nucleus of the Space Task Group to carry out the Mercury project. The group also devoted a lot of time to follow-on programs, and Faget led the initial design and analysis teams that studied the feasibility of a flight to the Moon. As a result of his work and other NASA research, President John F. Kennedy was able to commit the U.S. to a lunar landing by the end of the 1960s.

“Max was a genuine icon,” said NASA’s Associate Administrator for Space Operations William Readdy, “a down-to-earth Cajun with a very nuts-and-bolts approach to engineering. He contributed immeasurably to America’s successes in human spaceflight. His genius allowed us to compete and win the space race to the Moon.”



“Max Faget was truly a legend of the manned spaceflight program,” said Christopher C. Kraft, former Johnson Space Center director. “He was a true icon of the space program. There is no one in spaceflight history in this or any other country who has had a larger impact on man’s quest in space exploration. He was a colleague and a friend I regarded with the highest esteem. History will remember him as one of the really great scientists of the 20th Century.”

Faget took part in the original feasibility study for the Space Shuttle. His team then focused on Shuttle development. He retired from NASA in 1981 following the second Shuttle mission (STS-2). His government service career spanned four decades.

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‘Gordo’s flying up ahead now’

by Kendra Phipps

Four sleek T-38 aircraft shoot across the sky during a cool, bright Houston morning. Suddenly one of them breaks away and soars straight up, impossibly vertical, until onlookers on the ground lose sight of it. It is still there, flying fearlessly, but can no longer be seen.

Four remaining members of an elite brotherhood were reduced to three when L. Gordon Cooper, one of the original Mercury 7 astronauts, passed away on Oct. 4. He may have broken away from the pack for now, but at a memorial service held at Johnson Space Center, his three comrades were certain that “Gordo” was there in spirit – along with Alan Shepard, Virgil “Gus” Grissom and D.K. “Deke” Slayton.

“Gordo’s flying up ahead now, with Al, Gus and Deke,” said Mercury Astronaut and Senator John Glenn. “I’m sure they’ll rendezvous up there somewhere.”

Glenn was joined at the memorial in the Teague Auditorium by fellow Mercury Astronauts Scott Carpenter and Walter Schirra. The three shared stories about Cooper and the early days of space flight.

Glenn recalled one time that Cooper had been fishing in a pond near a training facility. Afterwards, Cooper told an Air Force official that he met, “You have the biggest bullfrogs here that I’ve ever heard!”

“The guy said, ‘Mr. Cooper, those aren’t frogs, those are alligators,’” said Glenn. “And they were. I might add that Gordo didn’t fish there anymore after that.”

Carpenter spoke of the strong bond that the seven shared.

“The competition with the Russians forged a brotherhood that had no equal at that time – nor at this time, for that matter,” said Carpenter. “Gordon’s contribution was essential to the group’s solidarity, and we celebrate his contribution. At the same time, we remind ourselves that nothing of the construct of man stands forever. It is proper now to say, ‘Farewell, Gordon Cooper. It was an honor being a member of your fraternity.’”



Schirra acknowledged the current and former NASA employees, some of them legendary, present in the auditorium.

“I look out in the audience and I see a lot of the people who gave us a safe ride, and I want to say thank you,” said Schirra. “We regret losing Gordo; he was one of our good friends, not too bad of a water-skier and a heck of a good astronaut.”

Also present was Henri Landwirth of the Astronaut Scholarship Foundation, who honored the impact that Cooper has had on countless lives.

“Many young boys and girls, young men and women, dream big dreams because of who he was and what he did,” said Landwirth. “Many of them reach for the stars because he flew among them. Many Americans have a greater love for their country because of what he did.”

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Clockwise: Dr. Maxime Faget, Director of Engineering and Development at the Manned Spacecraft Center and New Zealand visitor with Saturn V model.

Dr. Maxime Faget (center), goes over documents with Dr. George E. Mueller (second left), NASA's Associate Administrator for Manned Space Flight; and Charles W. Mathews (right foreground), Manager, Gemini Program Office.

Oil painting of Dr. Maxime Faget made from a Bldg. 8 portrait sitting.

After retiring from NASA, Faget was among the founders of one of the early private space companies, Space Industries Inc., established in 1982. One of its projects was the Wake Shield Facility, built for the University of Houston and flown twice aboard the Space Shuttle to demonstrate a technique for processing material in a near-perfect vacuum.

Born on August 26, 1921, in Stann Creek, British Honduras, Faget graduated from Louisiana State University with a Bachelor of Science degree in mechanical engineering in 1943. He joined the U.S. Navy where he saw considerable combat as an officer in the submarine service.

Faget's numerous accomplishments include patents on the "Aerial Capsule Emergency Separation Device" (escape tower),

the "Survival Couch," the "Mercury Capsule," and a "Mach Number Indicator."

He received numerous honors and awards, including the Arthur S. Flemming Award, the NASA Medal for Outstanding Leadership, and honorary doctorate of engineering degrees from the University of Pittsburgh and Louisiana State University. He was inducted into the National Space Hall of Fame in 1969 and the National Inventors Hall of Fame in 2003. Faget was the first recipient of the Rotary National Award for Space Achievement in 1987.

Faget was preceded in death by his wife Nancy in 1994. He is survived by four children: Ann, Carol, Guy, and Nanette; a daughter-in-law, two sons-in-law and 10 grandchildren.



Clockwise: L. Gordon Cooper with his fellow Mercury astronauts in Houston, in a 1963 photo. From left: Cooper, Wally Schirra (partially obscured), Alan Shepard, Gus Grissom, John Glenn, "Deke" Slayton and Scott Carpenter.

Full-length portrait of Cooper in spacesuit during Mercury-Atlas 9 prelaunch activities.

Cooper has a smile for the recovery crew of the U.S.S. Kearsarge, after he is on board from a successful 22-orbit mission of the Earth in his Mercury spacecraft "Faith 7."

"If I could share only one memory of Gordo, it would be his constant willingness to help others in as many different ways as he could," said Landwirth.

Following speeches by the astronauts and Landwirth, a photo and video montage of Cooper was shown and NASA Administrator Sean O'Keefe gave his remarks.

"When Gordon was introduced to the country, NASA already knew what the public was about to find out: he was unflappable – a natural stick-and-rudder man – and he was also a character," said O'Keefe. "Even in his later years, when space flight was far behind him, he hoped for a space program that would again inspire the country."

O'Keefe presented Cooper's widow with the NASA Distinguished Service Medal –the Agency's highest honor. A downlink from the International Space Station showed Expedition 9 Flight Engineer and ISS Science Officer Mike Fincke, along with Commander Gennady Padalka, honoring Cooper with a moment of silence and a ringing of the Station's bell.

Guests then headed for the Memorial Tree Grove, where a tree was planted in Cooper's honor. A poignant T-38 flyover in the missing-man formation concluded the memorial.

"You could always depend on Gordo," said Glenn. "It's hard to believe he's not here in person, but I know he's here in spirit and I bet he's enjoying the whole thing."